



BRIDGE CONSTRUCTION MEMO 2-14.0
SECTION 2-MISCELLANEOUS
INFORMATION AND
INSTRUCTIONS

July 1, 1995

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Disasters Affecting Bridge Work

The Office of Structure Construction has been faced many times with the necessity for taking immediate action to maintain bridges damaged or destroyed by earthquakes, flood, fire, and traffic accidents. When disasters are widespread and many bridges affected, the necessity for immediate investigation to determine the extent of damage as well as the actual restoration work involved requires an effort far beyond that which the Office of Structure Maintenance and Investigations is staffed to handle. Under these circumstances all Structure personnel are expected to assist in obtaining information as to the extent of the disaster and the damage sustained by State highway facilities, and to perform other activities as required to minimize the time between the occurrence of the disaster and restoration of highway facilities.

When disasters are widespread, regular lines of communication and transportation are often cut off; therefore, it is necessary to rely on the geographical distribution of field personnel to obtain needed information. If telephone communications have been destroyed, Office of Structure Construction personnel should use radio communications. If the Structure employee's State vehicle is not equipped with a radio, use District Maintenance radio facilities. If the Structure employee's State vehicle is equipped with a radio and no emergency exists in the immediate area, report in to the nearest District Communications Center so that available personnel may be utilized where needed. The important point is to establish communications with the Office of Structure Construction Headquarters and the District office, preferably through the Area Construction Manager, without delay, if a disaster should occur.

While field personnel will be expected to use their own judgment as to the immediate action to be taken, the following check list may be used as a guide by personnel who are in the vicinity of bridges which are damaged or destroyed as a result of a disaster:

1. After securing the safety of their home and family, and the stability of their project worksite; Structure personnel in the vicinity of the disaster will make an immediate investigation of all structures in the affected area to determine the extent of damage. See Attachment No. 1 for suggested guidelines to assist in determining the extent of damage.
2. If any structure has been destroyed or sustained damage which would render it unsafe for public traffic, immediate steps should be taken to close it to traffic. Road closures or restrictions should be reported immediately to the District office and to the California Highway Patrol. If District personnel are present, the matter of traffic control should be left to them-and Structure personnel should give whatever assistance is required.

3. As soon as possible a damage report should be made to the Office of Structure Construction in Sacramento, the District office and the Area Construction Manager by the most expeditious form of communication available.
4. When inspecting damaged bridges, sufficient data should be collected to make possible a realistic appraisal of the damage and an accurate estimate of the repair work which will be required. The data reported should be as complete as possible, including the time and day that the report was made, the bridge name and number and the exact location, (i.e. the route and post mile).
5. Take pictures and submit them as soon as possible to the Office of Structure Construction in Sacramento. If the bridge has been destroyed or closed to vehicular traffic, investigate the site to determine the feasibility of a detour crossing and include this information in this information in the report.

SUGGESTED GUIDELINES WHEN INSPECTING FOR STRUCTURAL DAMAGE AFTER A DISASTER

1. Much of the damage will be at transverse joints, hinges, abutments, etc. These areas indicate how much movement has occurred, which is an indication of how much damage to expect.
2. Misalignments at joints, particularly for skewed structures may be an indication of serious damage. Examples of where damage may have occurred include places where the face of the barrier rail does not line up, or where the deck joint has a sizeable "bump" or step.
3. Concrete spalls at barrier rail parapet joints may look bad; however, these spalls may be caused when hinge areas move more than the rail joints provide for. If the front and top face of the barrier rail lines up and the deck is without significant steps, then the bearings are probably in place and functioning.
4. In plain view, skewed bridges tend to rotate in the direction of the acute corner of the skewed deck surface. This may result in significant spalling of the rail parapet face. If at least fifty percent of the bearing area has contact, the concrete bridge probably can remain open. However, the bearings may need repair as soon as possible.
5. Diagonal shear cracks at bents and piers may not be serious if the bottom soffit/column joint appears normal.
6. It is not necessary to determine what may have caused the cracks in the concrete. Just record your observations in your report for the Office of Structure Maintenance and Investigations.
7. The conventional numbering sequence should be used to describe the damage. Conventionally, post miles increase from south to north and from west to east. Conventionally, girders are numbered from left to right as you stand on Abutment No. 1 and look upstation. Structure personnel numbering convention that is peculiar to their area. These differences are common in metropolitan areas where the NS/ E-W routing may be meaningless. If the numbering sequence is not known, assume the conventional numbering sequence and state the assumption on the report.
8. When determining damage, rough measurements may become necessary and are useful. More accurate measurements can be taken if damage appears to be critical during later analysis of your findings.
9. For steel girder bridges, look for bowed members, since the X-bracing between girders may have buckled. Welds do not normally shear crack unless the brace members are very stiff. The carrying capacity of the steel girder may not be adversely affected unless they are out of plumb. Bearings for steel girder bridges are critical. Reduced bearing areas under steel girders may potentially cause the girders to rotate out-of-plumb.
10. During high water, note debris or log jams that may cause damage to the superstructure by lateral loading, or by directing high flows under the footings, causing undermining. Note the size of the debris or log jam in your report so that Maintenance forces will have some idea of how to remove it. After high waters recede, check steel Xbracing and girder bearings as described in Note 9 above.
11. After high waters recede, check rip/rap slope protection upstream and downstream of bridge abutments for signs of failure. Check levees at abutments for signs of piping and

failure. Look for exposed piling at footings and suggest appropriate emergency repair techniques in your report. Note approximate floodwater levels by silt marks or debris in surrounding vegetation or watermarks on structure. review.

12. Don't be forced into actions that are against your better engineering judgement. State your informed opinion and stick with it. Be conservative but not overly cautious when determining if a bridge should be temporarily closed to public traffic as it can later be reopened after further
13. Watch out for your own personal safety. Be alert for situations' that are dangerous. This may require you to get assistance when entering areas that are known to be unsafe.
14. These guidelines are written to address our response to natural disasters. However, they may be applied to any event that threatens structures.